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GAS ABSTRACTS

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CONTENTS

1. Gas Industry 133
2. Appliances 133
3. Combustion and Industrial Furnaces 135
4. Carbonization and Gasification 136
5. Natural Gas and Natural Gas Condensates 140
6. Petroleum and Synthetic Liquid Fuels 143
7. Analytical Methods and Tests 145
8. General and Physical Chemistry 146
9. Organic Chemistry 147
10. Chemical Engineering 147
11. Process Equipment and Instrumentation 150
12. Materials of Construction 151
13. New Books 152

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1. GAS INDUSTRY

Electric Competition

Carlson, H. R. THE HOT WAR OF ELECTRIC COMPETITION. *Gas Age*, **111**, 63-66 (1953) May.

Trends in the new home market, in industrial and commercial use of gas, and among gas appliance manufacturers are analyzed here, with suggestions on some of the answers and the costs. Author's Abstract

Pacific Northwest Gas

Gellert, N. H. A BILLION AMERICAN DOLLARS FOR CANADA OR THE UNITED STATES? *Gas Age*, **111**, 28-31, 74 (1953) June 4.

The natural gas project for the Pacific Northwest will involve more than a billion dollars in the 20 years for which a pipeline will be financed. This article reviews the arguments for and against a pipeline from Canadian fields, and suggests that at present it appears wiser to make the investment in a line from New Mexico and California fields, than from Canadian.
A. E. Neumann

SWITCH IN EMPHASIS. *Chem. Week*, **72**, 36, 38 (1953) June 6.

A short discussion is presented concerning the anticipated arrival of natural gas in the Pacific Northwest and the subsequent problems involved in the conversion of low Btu oil gas generators to high Btu production.
R. Parker

Research

Cattell, R. A. PETROLEUM AND NATURAL GAS RESEARCH PROGRAM BUREAU OF MINES, FISCAL YEAR 1952. U. S. Bureau of Mines Inf. Circ. 7659. (1953) April.

The specific research accomplishments of 1952 are described briefly under the general divisions: oil and gas development and production; secondary recovery; petroleum chemistry and refining; thermodynamics of petroleum; and, transportation of natural gas. B. E. Eakin

Texas Taxes

HIGHER TAXES ON TEXAS GAS ARE NOT ADVISABLE. *World Oil*, **136**, 76-77 (1953) May.

Texas, which produces about half the natural gas consumed in the United States, currently taxes natural gas at a rate of about 12% of its value, and among the tax bills before the legislature is one which would increase the rate to about 40%. More than half of its production is used within Texas, and this new levy would hit home-state consumers and worsen the state's competitive position. The article closes with a summary of taxes imposed by states competing with Texas for markets.
A. E. Neumann

2. APPLIANCES

Burner

Berry, M. F. COMBUSTION CHAMBER FOR GASEOUS FUELS. U. S. 2,638,975 (1953) May 19.

A conversion burner which eliminates flashback and is not affected by varying gas pressures is described. A. R. Khan

Clothes Driers

Geldhof, P. E. and Morrison, H. E. (assigned to Whirlpool Corp.) GAS-HEATED DRIER. U. S. 2,635,354 (1953) April 21.

A gas-heated clothes drier of the rotating drum type is described. E. F. Searight

Cooking

Inskeep, P. NINE REASONS WHY GAS IS BEST FOR COMMERCIAL COOKING. *Gas Age*, **3**, 35-38 (1953) June 4.

Gas is superior to electricity because it is more economical, controllable, speedy, safe, dependable, clean, cool, accepted by the hotel and restaurant operator, makes more profits for him.
Author's Abstract

Load Forecasting

Knoy, M. F. and Turnan, J. L. LOAD FORECASTING USING THE "NORMAL WEATHER PATTERN". *Gas*, **29**, 35-38 (1953) June.

A method of load forecasting employing the use of various curves obtained from previous seasons' operations is discussed. Sample curves are given, and the procedure outlined.

E. F. Searight

Space Heating

Bjerkeseth, E. ELECTRIC ROOM HEATING IN NORWAY. *Heating and Ventilating*, 50, 82-83 (1953) June.

Details are presented of an electrically heated radiant panel that is widely used for residential and commercial applications in Norway. Included is a description of how the system is used for church heating.

Author's Abstract

Harris, W. S. and Martin, R. J. HEAT TRANSMITTED TO THE I-B-R RESEARCH HOME FROM THE INSIDE CHIMNEY. Univ. Illinois Eng. Expt. Sta. Bull. Series No. 407 (1953) January; *Heating, Piping, Air Conditioning*, 25, 131-37 (1953) May.

The heat derived from a chimney is usually ignored in calculating heat requirements of rooms through which a chimney passes. This study indicates that an inside chimney may supply 11 to 30 percent of the normal heat requirements of the rooms to which the sides of the chimney are exposed. A procedure for correcting the calculated heat loss of rooms for the heat gain from the chimney is given.

Authors' Abstract

Hastings, G. T. WHAT'S NEW IN WARM AIR HEATING? *Gas Heat*, 4, 52, 78 (1953) June.

A brief discussion is given of the change from inside-wall supply registers to outside-wall registers for warm air heating. E. F. Searight

Gilman, S. F. and Straub, H. E. and Hershey, A. E. and Engdahl, R. B. ROOM AIR DISTRIBUTION RESEARCH FOR YEAR 'ROUND AIR CONDITIONING PART I—SUPPLY OUTLETS AT ONE HIGH SIDEWALL LOCATION. *Heating, Piping & Air Conditioning*, 25, 121-131 (1953) April.

The initial results of a research project concerning room-air distribution for residential year 'round air conditioning are presented. With several types and sizes of supply outlets at one high sidewall location, studies of the air distribution in a test room were made under both summer cooling and winter heating conditions of operation. The effect of varying the flow rate and velocity of the supply air, the type and deflection setting of the supply outlet, and the location of the return intake are discussed. The next phase of the air distribution research project will deal with floor registers of both the conventional and perimeter types at various locations in the test room.

Author's Abstract

AIR-TO-AIR HEAT PUMP. *Heating, Piping & Air Conditioning*, 25, 88-92 (1953) April.

An installation in the Chicago area was found to give highly satisfactory results for both heating and cooling. Initial cost was less than for conventional equipment, and operating costs are competitive with other types of year-round air conditioning systems.

E. F. Searight

Water Heater Scale

Lang, P. WATER: ITS EFFECT ON GAS HEATERS. *Gas World* (British), 87, 1246-1249 (1953) May 9.

An informative article on the effects of water in water heaters. Scaling reduces the rate of heat transfer and decreases the efficiency. The critical temperature for scaling is 140°F above which deposition increases. Since the temperature of water heaters is in this range, the treatment of water is important. Natural and artificial zeolites are used to remove hardness. The usual descaling methods are manual or by acid reaction. The use of sodium metaphosphate as a softener is also discussed. A. R. Khan

3. COMBUSTION AND INDUSTRIAL FURNACES

Blast Furnace Linings

Wilde, T. G. and Nolan, V. J. PROGRESS REPORT ON CARBON BLAST FURNACES.

Blast Furn. and Steel Plant, **41**, 505-507 (1953) May.

Installations of carbon linings in blast furnaces, beginning in 1945, totalled 102 at the start of 1953 and will reach 119 at the end of the year. Remarkable trouble-free service has been obtained (up to 2½ million tons) with only 3 tap hole failures in 1948 and 1949. Of these carbon-equipped furnaces 27 are 26 to 28 ft. diam., 42 are 20 to 25.5 ft. and the remainder are smaller. Inspection of 32 linings in the past seven years show excellent condition of hearth side-wall and iron-notch, but the tendency to carbon loss in bottoms has led to locked-in construction and the increased thickness (7 ft. minimum). O. P. Brysch

Fuel Oil Sprays

Joyce, J. R. METHODS OF ATOMIZING LIQUID FUEL. *J. Inst. Petroleum* (British), **39**, 57-81 (1953) February.

After reference to the purpose and significance of liquid fuel atomization, and a detailed consideration of the mechanism and physical extent of the process, a general description is given of the main types of practical atomizer or oil burner, with comments on the operational requirements and characteristic features of each. Considerations affecting the choice of atomizers are reviewed, and a brief discussion of the cost of atomization follows. The desirable features to be looked for in a good atomizer are set out, followed by a reference to requirements in testing, including a consideration of specialized tests to examine spray pattern symmetry, and also spray particle size distribution. Author's Abstract

Heat Treating Furnace

Bremmer, F. H. and Zehnder, F. J. HEAT TREATING FURNACES HELP SAVE CRITICAL MATERIALS. *Ind. Heatings*, **20**, 913-916 (1953) May.

Deep oil-well casing, grade N-80, is made from plain carbon steel instead of the usual normalized and drawn high Mn-Moly steel. The new process imparts the necessary characteristics to the casting by means of continuous gas-fired heat-treating, quench and draw line. Twelve radiant gas-fired furnaces are used with eight carburetors to deliver pre-mixed fuel under pressure. The physical properties of the steel show it to be at least equal to the high Mn-Moly casing formerly made. A. R. Khan

Industrial Gas

Pardoe, T. H. SOME WAYS IN WHICH GAS CAN SERVE INDUSTRY. *Gas World* (British, 87, (Suppl.) 86-88, 90 (1953) May 16.

Same details are presented on industrial installations used for galvanizing, lithographic printing, bread baking, heat treatment, and foundry operations. The material is presented in an attempt to increase the gas consumption in southeastern England. R. Parker

Searle, A. F. FIRING POTTERY KILNS. *Gas World* (British) **137**, (Suppl.) 65-69 (1953) (1953) April 18.

A discussion on the firing of pottery kilns that emphasizes the many advantages in replacing coal by gas. A. J. Tulis

Ore Reduction

Kalling, B. M., Ameen, E. L. and Stalhed, J. L. (assigned to Stora Kopparbergs Bergslags Akt., Sweden) PROCESS FOR REDUCING ORES. U. S. 2,635,957 (1953) April 21.

Oxide ores continuously passing down a shaft furnace are reduced by a counter current flow of hot $CO:H_2$ mixture, injected at the base. At an intermediate level of the shaft, a part of the gas stream now high in CO_2 is withdrawn, cooled, and water content is removed. The CO_2 then is reduced to CO and H_2 is added by injecting a hydrocarbon and oxygen to the stream, reacting it with hot solid carbon in a separate zone and returning the reduced gas to the shaft. O. P. Brysch

Lewis, W. K. (assigned to Standard Oil Development Co.) PROCESS OF RECOVERING METALS BY GASEOUS REDUCTION. U. S. 2,638,414 (1953) May 12.

A process of recovering metal from finely divided oxidic ores (of iron) is claimed, in which

the ore is maintained in a densely fluidized bed by up-flowing hydrogen in each of several superimposed zones, with interposed packings to prevent back mixing but to permit down flow of ore of increasing degree of reduction. Heat may be provided by burning hydrogen in the upper zones, so that a partial pressure of hydrogen to steam in the off-gases falls in a ratio of 3 to 2. The off-gases are dried and recycled, and hydrocarbon gases may be cracked thermatomically by the partly reduced ore to provide fresh hydrogen. Reduced metal from the lowest zone may be de-slagged by melting with recovered carbon. O. P. Brysch

Radiant Heating

"RAPIRADIA" HIGH INTENSITY RADIANT HEAT UNIT. *Ind. Gas* (British), **16**, 231-232, 234, 236 (1953) May.

Tests performed on a tunnel-type, high temperature radiant unit showed satisfactory results. In view of the speed with which an object passing through the tunnel is heated, it is suggested that there is considerable utility for this type of high temperature radiant heating.
A. R. Khan

Textile Processing

Schutt, E. V. PROCESSING OF TEXTILES EMPLOYING BOTH NATURAL AND SYNTHETIC FABRICS. *Ind. Gas*, **31**, 8, 9, 25-28 (1953) May.

A brief description of various natural and synthetic fibers is given, followed by an account of the application of gas heat in textile processes. The greatest opportunity for the use of gas is in drying but radiant gas heat is also employed for tenter frames, singeing, stretching. A. R. Khan

Thermal Insulation

Thomas, R. and Turner, W. C. INSULATION FOR HEAT AND COLD. *Chem. Eng.*, **60**, 221-225 (1953) June.

Besides economic consideration of thermal insulation, there are other thickness requirements due to safety, surface temperature. A table of characteristics of insulating materials is added. A. R. Kahn

4. CARBONIZATION AND GASIFICATION

British Coal Industry 1952

National Coal Board. ANNUAL REPORT AND STATEMENT OF ACCOUNTS FOR YEAR ENDED 31st DECEMBER, 1952. London, HMSO, May (1953); *Gas World* **137**, 1533 (1953) May 30.

British coal mines produced 226.4 million tons in 1952, 3.5 million more than in 1951, with profits (before interest) of £5.7 million as compared to £21.2 million. Production costs per ton were 56*s* 9*d* in 1952 (49*s* 2*d* in 1951), with output of 299 tons/man year compared to 303 in 1951. Capital investment in reconstruction and expansion of collieries was £38 million in 1952, only 64% of what had been planned, as compared to £26.6 in 1951. Carbonization of 9,800,000 tons of coals in 51 operating plants in 1952 compares with 9,400,000 tons in 1951, with production of 44,900 MMCF of coke oven gas. £488,000 was spent on research; this will increase to £750,000 (about ¼*d* ton) in 1953. The labor force increased by 22,500 to 720,000; 20,000 miners houses were building, and 12,500 out of 23,000 men attended refresher training courses. O. P. Brysch

Coal Blending

Hall, G. E. and Lee, G. W. BLENDING OF COAL FOR CARBONIZATION, WITH SPECIAL REFERENCE TO OVEN COKE MANUFACTURE. *Inst. of Gas Engrs.* (British) Publ. No. 426, London (1953) May; *Gas World* **137**, 1391-95 (1953) May 23; *Gas Times* (British) **75**, 460, 465-68, 473 (1953) June 19.

Conservation of coking coals, improvement of coke quality, control of coking pressure, control of chemical quality of coke and adjustment of gaseous therm output are discussed as reasons for blending. Plant equipment is described briefly, as is usual plant practice and research in Britain and other countries. The development of blending, though primarily centered in the metallurgical plants, must be relied upon for conservation of coking and gas coals for future expansion of the industry and in this respect will be a factor of economic importance similar to transportation, plant size, yields and markets in the design of a carbonization plant.
O. P. Brysch

Martin, S. W. (assigned to Great Lakes Carbon Corp.) MANUFACTURE OF COKE. U. S. 2,640,016 (1953) May 26.

Production of satisfactory shatter- and abrasion-resistant metallurgical coke is claimed, in which petroleum coke of 14 to 35% volatile matter content and which agglomerates in the volatile matter test, is blended with high volatile bituminous coal in amounts of 5 to 25%, pulverized to at least 60% through 1/8-inch screen and carbonized in the usual manner.

O. P. Brysch

Minchin, L. T. COKE FROM WEAKLY-COKEING COALS. *Coke and Gas* (British) **15**, 167-171 (1953) May.

The smelting of Lorraine iron ores, long based upon coke from imported coals, has now become possible with local coals due to the success of three processes of coke making developed by the steel and the nationalized coal industry. The Carling process uses stamped blend of 65% of Lorraine "flambant gras A" coal of 40% volatile matter and 10 to 13% 0_2, with 25% Ruhr coal and 10% coke breeze ground to pass 0.2 mm. Separation of the fines (fusain) and the "hards" (poorly fusing durain) in a new washery is expected to yield sufficiently improved coking coal to permit dropping imported coal. The Marienau process cokes a dried blend of 20% low temperature char from Lorraine "flambants sec", 25% Saar coal and 55% Lorraine "gras B". The Burstlein (Sovaco) process utilizes a preparatory screening to separate plus 3-mm durain which is cleaned and finely ground and reblended. Although 20% Saar, 25% Ruhr, and 15% Aachen coals are now blended with these Lorraine fines and oil also is added, Burstlein believes that 100% Lorraine coal might be coked, if the cleaned durain fines were charred and reblended. O. P. Brysch

A MODERN COAL BLENDING PLANT. *Gas J.* (British) **274**, 210-12 (1953) April 22; *Fuel Economist* (British) **1**, 189-91 (1953) May 8.

A Robins-Messiter bed-blending system has been built, the first coal blending installation of this type, at the steelworks of John Summers & Sons Ltd., Shotton, Flint. Three triangular-section beds, each of 12,000 tons capacity, 975 ft. long, 56 ft. base width and 21 ft. high are installed, with two more projected. Beds are formed by conveyor-fed wing trippers which traverse the length of the pile at 50 ft./min. depositing thin layers of coal at loads up to 300 tons/hr. by boom-belts to either of two piles. A dozen coals of different coking properties are bedded at this plant. The actual blending is done by a traveling bridge reclaimer, which consists of a tined harrow reciprocating at a steep angle against the entire end surface of the pile and dislodging a thin cross-section of bedded coal, which falls down into a cross-pile conveyor in which a plow carries the coal to the side of the pile. Underground conveyors run lengthwise of the piles, to receive the coal from the cross-pile conveyors and transport it to the hammermills.

O. P. Brysch

Coal Properties

Shotts, R. Q. QUANTITATIVE PETROGRAPHIC COMPOSITION OF THREE ALABAMA COALS. *Mining Eng.*, 5, 522-526 (1953) May.

Nitric acid oxidation rate analyses of three coals, previously studied microscopically by the Bureau of Mines, revealed three components. Relative quantities agree with those found for the four components given by the Bureau and results are consistent with current ideas of coal constitution. Possible multi-component composition for bright coal and a reactivity rank relation are suggested. Author's Abstract

Coal Resources

Chamberlain, E. A. COALS FOR CARBONIZATION AND GASIFICATION IN SCOTLAND. *Gas J.*, (British) **274**, 213-16, 224 (1953) April 22.

Since the coals of the good old days will not be available again in abundance (in spite of improved efficiency and politics) revolutionary changes must occur in all uses of coal, including that in the gas making industry, if the nation is to survive. Basic factors for planning must consider (1) assessment of reserves of types of coal (2) trends of utilization of types by gas and coke industries (3) future requirements (4) possible readjustments of the car-

bonization industries to suit the coals. Coal cost, seam quality, blending for coke and gas production, complete gasification of low rank coals, Lurgi process, and gas grid systems will be of influence in the future of Scotland's industry. O. P. Brysch

Coal Storage

HOW CONSOLIDATED EDISON PACKS AND SEALS COAL PILES. *Power Eng.*, 57, 62, 63 (1953) May.

A method for compacting and sealing reserve coal piles in outdoor storage is described. Tractors and scrapers are used to pile and compact the coal to drive out the air. The top and side of the piles are sealed with a coating of tar. The tar keeps out moisture and air and presents coal dust from being blown about.

E. J. Pyrcioch

Coke Ovens

Petit, D. (assigned to Soc. de Technique Industrielle, France. COKE OVEN CONSTRUCTION. U. S. 2,637,685 (1953) May 5.

A method of coke oven construction is claimed in which the heating walls are made of silica (high thermal expansion) and the upper and lower portions of the battery are made of fireclay (low thermal expansion) refractories. Excessive expansion distortion of silica is avoided by separating each pair of vertical hairpin flues by vertical expansion joints of the usual tongue-and-proove type which are broken by overlapping horizontal mortise and tenon joints. Each flue-pair block may be tenoned into the top and bottom portions. O. P. Brysch

SHOTTON COKING PLANT. *Coke and Gas* (British), 15, 117-125, April; 155-61 (1953) May.

The new plant equipment added to the John Summers and Sons Ltd. steel plant at Shotton, near Chester, is described. One battery of 88 Simon-Carves underjet ovens has been put into operation and a similar battery is under construction. The Robins Messiter system is used for coal blending. Enlarged by-product handling equipment is a feature. O. P. Brysch

HCN Recovery

Drake, L. R., Stowe, S. C. and Broncek, K. F. (assigned to Dow Chem. Co.) METHOD FOR RECOVERY OF HYDROGEN CYANIDE. U. S. 2,634,823; 2,634,824; 2,634,825 (1953) April 14.

New solvents are claimed for the extraction and recovery of hydrogen cyanide from gaseous mixtures. These are stable solvents, whose HCN solutions normally exert low partial vapor pressures of HCN, but which release the HCN upon heating (distillation) and/or applying reduced pressure, and become regenerated for reuse. The first patent claims tri-alkyl phosphates or phosphonates; the second, di-alkyl phosphites; and the third, mono- or di-alkyles formamides as solvents. Interference of hydrocarbons and H2S is not mentioned. O. P. Brysch

H_2S Removal

Frazier, H. D. (assigned to The Fluor Corp., Ltd.) AMINE TREATING AND DEHYDRATION OF GASES. U. S. 2,638,405 (1953) May 12.

Simultaneous dehydration and removal of acidic impurities by treatment with aqueous amine solutions in a two-stage process is described and claimed. A dilute amine solution is used in the first stage and a concentrated solution having hygroscopic properties is used in the second stage. The process using methyl-diethanolamine is specifically claimed.

D. M. Mason

Townsend, L. G. OPERATION OF THE "MANCHESTER" LIQUID PURIFICATION PLANT AT LINACRE, LIVERPOOL. Inst. Gas Eng. No. 429 (British) (1953) May; *Gas World* (British) 137, 1396-97 (1953) May 23; 1797-1801, June 27; *Gas Times* (British) 75, 496-502, (1953) June 19.

Operating experience is described and cost data given on a plant of 3.5 MMCF/day capacity. It is concluded that the process is capable of operation to satisfy British legal purification requirements without use of catch boxes. A net cost of 1.23 pence/MCF is estimated.

D. M. Mason

Wainwright, H. W., Egleson, G. C., Brock, C. M., Fisher, J., and Sands, A. E. SELECTIVE

ABSORPTION OF HYDROGEN SULFIDE FROM SYNTHESIS GAS. *Ind. Eng. Chem.*, 45, 1378-1384 (1953) June.

Pilot plant data on selective absorption of H_2S in presence of CO_2 by tripotassium phosphate solutions and by potassium N-dimethylglycin solutions are presented. Some observations on removal of organic sulfur by these solutions are also reported. D. M. Mason

RECOVERY OF SULPHUR FROM FUEL GASES. *Coke and Gas* (British), 15, 135-139 (1953) April.

The Lecocq range of processes designed for most economic recovery of H_2S when complete removal is unnecessary has been offered for license in Great Britain by H. Balfour & Co., Ltd. The three processes are the Lecocq-Monasulf, the Lecocq-Sulfagen, and the Lecocq-Sulfazil. The Monasulf and Sulfagen processes are adapted to coal and coke oven gases; the former is an ammonia-working process in which H_2S is recovered as such and the ammonia is returned to the gas. In the latter a washing solution of ammonium sulfite and bisulfite is used; ammonium sulfate and elementary sulfur are produced. The third process, the Sulfazil, is an absorption-desorption process using solutions of strong bases and weak organic acids. A number of different solutions are available whose use depends on the H_2S—CO_2 selectivity desired, and the presence of HCN and other impurities. A Claus-type process for production of elemental sulfur, called the Lecocq-Recsulf process, is also described. D. M. Mason

Hydrogenated Coal Gas

Kalbach, J. C. (assigned to Hydrocarbon-Research, Inc.) PRODUCTION OF FUEL GAS FROM CARBONACEOUS SOLIDS. U. S. 2,639,982 (1953) May 26.

Coals or oil shales, crushed to pass ¼-inch, are made into a slurry with a hydrocarbon (coal-derived) oil, a catalyst is added and the slurry preheated to 550 to 1000°F. and pumped to a reactor where it is hydrogenated at 750 to 1000 psi. A mixture of hydrogen and carbon monoxide (generated by gasifying the solid char residue from the hydrogenation step) may be used, under conditions to vaporize the oil and give a densely fluidized bed, to yield a rich fuel gas. O. P. Brysch

Reforming Hydrocarbons

Shapleigh, J. H. (assigned to Hercules Powder Co.) CATALYTIC DECOMPOSITION OF HYDROCARBONS. U. S. 2,689,223 (1953) May 19.

A process utilizing a catalyst comprising nickel, zirconium silicate and magnesia to catalytically reform hydrocarbons and steam is patented. The catalyst is claimed to be a higher sulfur resistant catalyst than the normal nickel catalyst now in use. H. A. Dirksen

Synthesis Gas

Boreilli, T. and Righi, A. PRODUZIONE DI GAS DI SINTESI PER GASSIFICAZIONE DI OLI COMBUSTIBILI PESANTI CON OSSIGENO E VAPORE. (PRODUCTION OF SYNTHESIS GASES THROUGH GASIFICATION OF HEAVY COMBUSTIBLE OILS WITH OXYGEN AND STEAM. *Rivista Combustibili* (Italian), 7, 196-220 (1953) April.

A review of processes for the gasification of liquid hydrocarbons to produce synthesis gases is given followed by a description of the commercial unit utilizing the Fauser process. In the process an alkaline earth is mixed with the charge stock before the reaction which is carried out at approximately 1200°C with a mixture of oxygen and steam. H. A. Dirksen

Mayland, B. J. and Steward, S. G. (assigned to Phillips Petroleum Co.) PROCESS FOR MAKING SYNTHESIS GAS WITH A 1:1 RATIO H2 TO CO. U. S. 2,638,452 (1953) May 12.

It is claimed that CO and H_2 may be produced in a 1:1 mol ratio by partial oxidation of methane and quenching of the oxidation before it goes to completion. G. V. Vosseller

Steeves, A. B. (assigned to Standard Oil Development Co.) APPARATUS FOR CLOSE TEMPERATURE CONTROL OF CATALYZED GAS REACTIONS. U. S. 2,638,407 (1953) May 12.

A method and apparatus are provided in which a given reaction may be carried out with uniformity of results and maximum efficiency regardless of the magnitude of the operation involved. H. A. Dirksen

Underground Gasification

Masterman, C. A. UNDERGROUND-GASIFICATION TRIALS 1951-52, IN BRITAIN. *J. Inst. Fuel* (British), 25, 426-35 (1953) May.

Earlier work on underground gasification in 1950 at Newman Spinney (Gas Abs. 7, 6, 93) has been continued there, and at an additional test site at Rockmoor, Bayton, Worcestershire. Low grade unmineable coal has been gasified in 30 test-spans in 4 different seams, 400 tons in 1951 and 650 tons in 1952. Linkage of the boreholes was achieved by high-pressure air passed into one or more cemented casings, while the ignition and the removal of gas occurred at offtake holes 12 to 50 feet away. This system was very unreliable, even with oxygen enrichment up to 70%. Gasification results have been limited as a consequence of linkage difficulties. High resistances to airflow have prevented use of high air rates, so that the reaction zone remains wet and the useful gas yields low. High outlet temperatures (1000°C) have led to designs for refractory or waterjacketed outlet holes and to operation with reversal of air blast between inlet and outlet. Special designs of prime movers (internal combustion engines, gas turbines and steam engines) may be required if the gas calorific value cannot be held above 80 Btu/CF. Consistent faster linkage in spans of 100 yds. would ensure commercial application, hence projected work includes electro linking, man-shafts with directed drilling or burning of boreholes, and a shaft and gallery system. Costs and economic limitations are discussed and tabulations of the operating data are given.

O. P. Brysch

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Carbon Black

Venuto, L. J. (assigned to Columbian Carbon Company) FURNACE BLACK PELLETIZING PROCESS. U. S. 2,639,225 (1953) May 19.

A process for pelletizing furnace black is claimed utilizing water and a surface-active wetting agent, which produces a much stronger pellet.

B. E. Eakin

Condensate Production

Klotz, J. A. CONDENSATE PRODUCTION. *J. Petroleum Techn.*, 5, 27-29 (1953) May.

Economics of production by pressure depletion and production by cycling are discussed. Economics of cycling at three different pressures—100, 40, and 12 per cent of the original reservoir pressure are analyzed.

D. C. Gami

Reidel, J. C. ULYSSES PLANT NOW STANOLIND'S LARGEST. *Oil Gas J.*, 52, 156-58, 244 (1953) May 25.

Recent expansion enlarges gas processing capacity to 325 MMCF of the gas from the Hugoton field. The plant recovers over 30,000 gal of propane and 56,000 gal of mixed butanes and heavier per day. The residue sales gas has a minimum gross heating value of 925 Btu/cu ft.

B. E. Eakin

Cycling Problems

Crawford, D. M. GAS LIFT USED TO PRODUCE PLYMOUTH FIELD WELLS. *Oil Gas J.*, 52, 100-101 (1953) May 11.

Gas lifts are installed to remove salt water within well bores, to induce wells to flow at allowable rates without choking with water, and to keep sand moving out of the well bore at all times. The wells tend to flow naturally at present, and the lift is operated only when either of the producing zones starts loading with water.

B. E. Eakin

Fletcher, P. E. A LOOK AT GAS-INJECTION PROJECTS IN WEST TEXAS. *Oil Gas J.*, 52, 230-34, 237, 240-43 (1953) May 25.

This paper discusses gas-injection projects in West Texas from the initial project in 1930 to the present time. For 12 years prior to 1942, all gas was injected into sandstone formations, at relatively shallow depths. In recent years the trend has been toward injecting into limestone and dolomite formations, at increasing depths and at higher injection pressures and daily volumes. One company has a project under full pressure maintenance with the injected volume

of gas equalling 150 per cent of the gas produced from the reservoir. Author's Abstract

Oxford, C. W., Huntington, R. L. VAPORIZATION OF HYDROCARBONS FROM AN UNCONSOLIDATED SAND. *J. Petroleum Techn.*, 5, 15-18 (1953) May.

Effect of withdrawal and cycling rates, pressure, temperature, percentage of liquid hydrocarbon and water saturation within the reservoir on the vaporization of condensates by batchwise pressure depletion and constant pressure cycling methods are studied. Within the range of the variable studied the withdrawal rate and the pressure of brine and water within the reservoir have very little effect on the vaporization of hydrocarbons. For a constant pressure vaporization, approach to equilibrium is a function of space velocity. However, since the departure from 100% of equilibrium recovery takes place up to a space velocity of approximately 5 reservoir volumes/minute, one would expect equilibrium recovery from producing reservoirs. D. C. Gami

Vaughan, H. E. HOW RISING COST OF GAS AFFECTS GASOLINE AND CYCLING-PLANT ECONOMICS. *Oil Gas J.*, 52, 107-108 (1953) June 1.

As the value of gas increases, fuel and shrinkage losses become more and more of a major economic factor. Within shrinking profit margin, it is imperative that operating cost per gallon be shaved, investment cost per gallon reduced, and that effort should be devoted to creating markets which permit a fair return on investment. Author's Abstract

Gas Conditioning

Mize, W. W. PLANT GETS GAS FROM TWO SOURCES. *Oil Gas J.*, 51, 258, 260, 261 (1953) April 27.

The San Juan Plant of El Paso Natural Gas Co. which treats gas from two different fields is described. The gas from one field which contains 1% hydrogen sulfide and 15% carbon dioxide is treated with a solution containing monoethanolamine in a contacter for removal of the two constituents. The other gas is free of hydrogen sulfide and carbon dioxide but contains sufficient natural gasoline, butane and propane and must be treated for removal of these liquid products. The treated gases are mixed and dehydrated with dry desiccants and transmitted to customers. E. J. Pyrcioch

LP-Gas Production

Heath, R. W. (assigned to Signal Oil and Gas Co.) ABSORPTION METHOD FOR SEPARATING HYDROCARBON GASES. U. S. 2,640,008 (1953) May 26.

A process for separating hydrocarbons from hydrocarbon gases which eliminates atmospheric or forced-draft water cooling towers and boilers is claimed. This is an oil absorption process where necessary cooling is obtained by air coolers, and power required for all drives is obtained from gas engines using natural gas after removal of gasoline.
D. C. Gami

SURVEY OF NATURAL-GAS FIELD PROCESSING PLANTS. *Oil Gas J.*, 51, 214, 216, 218, 221, 222: SURVEY OF CYCLING-PLANT OPERATIONS. 225, 226, 228 (1953) April 27.

468 plants produce 660,419 bbl/day of LP-Gas and natural gasolines from natural gas sources. In addition 48 cycling plants produce an additional 165,419 bbl/day. LP-Gas production is 62.3 per cent of the total. The individual production of each plant is listed by states and counties. W. G. Bair

LP-Gas Motor Fuel

Burk, F. C., Black, E. S. and Test, L. J. IS LPG A CHEAP MOTOR FUEL? *Petroleum Refiner*, 32, 119-121 (1953) June.

A cost comparison of diesel fuel, gasoline and LP-gas was made on 20 new buses for a period of two years (about 80,000 miles). The test details and results are discussed. Projected costs for 5 years on 200,000 miles of operation taking in to account all normal expenses except fuel storage costs for LP-gas show that the Diesel-fuel operated bus is the most economical, with gasoline next, and LP-gas the most expensive fuel. H. A. Dirksen

LP-Gas Pipeline

Rides, LPG, A NEW PIPELINE FROM TEXAS TO INDIANA. *Butane-Propane News*, 15, 57-60 (1953) June.

A pictorial story is shown of the huge expansion in transmission and storage facilities by the Phillips Petroleum Company to make more liquified petrodeum gas available to midwestern markets. J. M. Reid

Metering

Rittmann, C. F., Jr. HIGH GAS PRICES IMPOSE NEED FOR GREATER METERING ACCURACY. *Oil Gas J.* 51, 271, 275, 279 (1953) April 27.

A description of the metering program of the El Paso Natural Gas Company. Discussion includes the topics of large diameter orifice fittings, purchase meters, meter stations, H_2S protection, calorimeter installations, right of way taps, and station design.

R. F. Bukacek

Stovall, E. E. TESTING OF LARGE DIAMETER ORIFICE TUBES. Paper No. TS-53-8 Am. Gas Assoc., Operating Section, Chicago, April-May, 1953.

These tests are being run to determine whether the present orifice-meter flow coefficients up to 16 in diam can be extrapolated accurately for 30 in pipe. The results to date indicate that the data in A.G.A. Report No. 2 for flange taps can be extrapolated for use on larger diameter tubes with approximately the same degree of tolerance as for the smaller tested sections.

B. E. Eakin

Odorization

Manfred, N. A. THE DESIGN OF ODORIZER INSTALLATIONS IN DISTRIBUTION SYSTEM. *Gas Age*, 111, 31-35 (1953) May 7.

This article includes a discussion of proper design and location of the orifice assembler for uniform odorization. Problems encountered with the use of various types of odorizers, including chemical pumps, are discussed. Satisfactory methods of dealing with cold weather conditions, vented gases, and odorant leakage at pipe joints and valves are described.

C. E. Hummel

Offshore Corrosion

Caldwell, J. A. and Lytle, M. L. BACTERIAL CORROSION OF OFFSHORE STRUCTURES. *Corrosion*, 9, 192-196 (1953) June.

Reports published by the British Admiralty and by individuals in England and the United States, show that sulfate-reducing bacteria can cause corrosion of iron under some conditions. Because of the importance of maintaining in good condition the steel piling of offshore structures in the Gulf of Mexico a research investigation of the possibility of bacterial corrosion of these installations was inaugurated. Laboratory tests were directed toward developing fairly pure cultures of sulfate-reducing bacteria and using them in both natural muds and synthetic culture media for the purpose of determining their effect on the corrosion rate of steel coupons under anaerobic conditions. Maximum corrosion rates obtained were of the order of 0.00. inch per year. Several assemblies of twenty coupons each were installed at a marine platform approximately seven miles off Grand Isle, Louisiana; the coupons on each assembly were spaced to extend a few feet above and a few feet below the mud line. Somewhat similar assemblies were installed immediately offshore at Barbour's Cut, near La Porte, Texas and at the Crash-Boat Basin at Galveston, Texas. Results of the study show that the corrosion rate due to bacterial action is low, and that cathodic protection is a sufficient safeguard against bacterial corrosion. Authors' Abstract

Storage

Wiggins, J. H. DRY SEAL PISTON-TYPE GAS HOLDER. U. S. 2,639,229 (1953) May 19.

Transmission

Bentz, K. METHODS USED TO REPAIR BROKEN RIVER LINES. *Petroleum Eng.*, 25, D15-D16 (1953) May.

Texas Illinois Pipe Line Company had two 20 in. lines of a three-line submerged crossing of the Mississippi go out. Failure was determined as due to tension in the line. Repairs were ac-

complished by excavation and lifting of the lines to the surface. B. E. Eakin

Miller, W. H. GAS-TURBINE-DRIVEN CENTRIFUGAL COMPRESSORS. *Oil Gas J.*, **51**, 244, 246, 248, 251 (1953) April 27.

Article describes program by which Southern Division of El Paso Natural Gas Company is using gas-turbine-driven centrifugal compressors to increase capacity of its line from 901 to 1221 MMCFD. Plans call for construction of ten new stations between existing reciprocating stations, with installation of 28 gas turbines each of 5000 rated hp driving a single-wheel centrifugal compressor. Turbine inlet gas temperature is 1450° F, thermal efficiency of prime mover 25%. Probably the outstanding feature of the new stations is the push-button operation which permits completely automatic control of starting sequence in addition to the normal automatic speed-control to maintain desired station outlet-gas pressure. Maintenance, dispatching, and personnel training are discussed. P. T. Trumpler

Perkins, C. L. THE STORY OF EL PASO NATURAL GAS CO.'S QUARTER CENTURY OF GROWTH. *Oil Gas J.*, **51**, 242, 243, 280, 282 (1953) April 27.

The company was founded in 1928, but the major portion of the growth has taken place not until 1946. Current main-line deliveries are 1,200 MMCFD, when present construction is completed deliveries will be improved to 1,500 MMCFD. An application is pending for authority for a further increase in main-line capacity to 1,900 MMCFD. W. J. Pleticka

Underground Storage

Billue, G. H. UNDERGROUND STORAGE OF HYDROCARBONS TODAY. *Petroleum Refiner*, **32**, 136-138 (1953) April.

Development of underground storage from salt bads and domes is described. A list of such storage in the United States including type, location, capacity and name of the company is given. D. C. Gami

Ferguson, W. E. DEVELOPMENT AND OPERATION OF THE BENTON UNDERGROUND STORAGE PROJECT. *Gas Age*, **111**, 45-49, 86-90 (1953) May 7.

Development of the Benton underground storage project of the Ohio Fuel Gas Company is reviewed. Located in the Clinton sand with a capacity of over 27,717 MMCF, Benton has been in operation since 1936. A detailed study of the preliminary geological survey and preparation of the field and existing wells for storage, together with operating data and techniques are presented. In addition, questions most commonly raised in relation to underground storage of gas are discussed. J. M. Reid

Thomas, H. R. UNDERGROUND STORAGE. *Oil Gas J.*, **52**, 95-97 (1953) June 1.

The economics of underground storage of LP-gases both at the point of production and in the marketing area are illustrated by two hypothetical plant examples: one with underground storage and one without. Increased plant revenue is realized through elimination of idle tank car rental during the summer and sale of total plant capacity on a year round basis. Additional advantages of reducing peak shortages, increased storage safety, and reduced steal requirements are cited. J. M. Reid

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Desulfurization

Hoog, H., Klinkert, H. G. and Schaafsma, A. NEW SHELL HYDRODESULFURIZATION PROCESS SHOWS THESE FEATURES. *Petroleum Refiner*, **32**, 137-141 (1953) May.

This improved catalytic hydrodesulfurization process upgrades high-sulfur stocks, such as straight-run and catalytically cracked gas oils, and shale oils. The application of the "trickle" technique, in which the feed flows downwardly as a thin liquid film over catalyst particles in a fixed bed in the presence of a low hydrogen-recycle flow, results in a reduction of 15 to 20 percent in capital investment and operating cost relative to vapor-phase operation. High-boiling feed stocks may be more economically desulfurized by the process, inasmuch as it is not necessary to vaporize completely the reactor-charge

stream. A sulfur removal of 85 to 90 percent is easily obtained, with long catalyst life without regeneration. Authors' Abstract

Edgar, J. L. THE USE OF SULPHURIC ACID IN A TOTALLY ENCLOSED REACTION SYSTEM. *Inst. Chem. Eng. Trans.* (British), 30, 262-276, No. 4 (1952).

The use in a modern oil refinery of the sulfur derived from crude petroleum is surveyed and discussed. The application of sulfuric acid in a closed cycle to the manufacture of synthetic solvents is considered, and the reconcentration of the acid used in the process is described in detail. Author's Abstract

Distillation Processes

Berg, C. H. (assigned to Union Oil Co. of California) OIL-SHALE EDUCTION PROCESS AND APPARATUS. U. S. 2,640,014; 2,640,019 (1953) May 26.

An internally-fired apparatus for continuous treatment of carbonaceous solids (oil shales) to recover gaseous and liquid products is described. There are claimed: minimum decomposition of liquid products by operation at temperatures below those at which appreciable pyrolysis occurs, effectiveness with full range of particle sizes and fines due to agitation in the kiln by rotary plows, increased recovery of liquids due to use of an ultrasonic generator to agglomerate suspended liquid particles.
E. B. Shultz, Jr.

Leffer, F. W. (assigned to Universal Oil Products Co.) METHOD FOR DISTILLING SOLID HYDROCARBONACEOUS MATERIAL. U. S. 2,639,263 (1953) May 19.

Hydrocarbonaceous material, such as oil shale, cannel, in finely divided form is fed downwardly into a confined distillation zone maintained at a distilling temperature by an upwardly flowing stream of hot, oxygen-free combustion gases. Gas and distillation products are drawn off the top, and carbonized solids from the bottom, where they meet a transporting gas which transfers them to a confined combustion zone at a higher level. Oxygen-bearing gas is injected into the lower part of this burning zone, to burn out residual carbon and form the hot oxygen-free combustion gases used above for distilling and transporting. The hot burned residue may exchange its heat in another zone with a fluid medium (water, steam, gas) used later in distillation. O. P. Brysch

Kassel, L. S. (assigned to Universal Oil Products Co.) DISTILLATION OF SOLID CARBONACEOUS MATERIALS. U. S. 2,637,683 (1953) May 5.

A method for treating hydrocarbonaceous materials for the removal of organic constituents and consisting of a combined solvent extraction and high temperature distillation operation is described. E. J. Pyrcioch

Exploration Costs

Struth, H. J. OIL FINDING COST UP 49 PER CENT. *Petroleum Eng.*, A69, 72-76, 82, 86-88, 91, 92 (1953) May.

Replacing the oil reserves used each year is costing the producing companies an increasing percentage of their revenue. In 1948 initial finding costs averaged 58.5 *c*/bbl; in 1953 the inital finding costs averaged 98 *c*/bbl. But the immediate outlook for the price of crude is for no increase which will in any way off-set the very marked rise in exploration costs.
B. E. Eakin

Hydrogenation

Boelhouwer, C., Hoolboom, M. A., Perquin, J. N. and Waterman, H. I. THE CATALYTIC DESTRUCTIVE HYDROGENATION OF PARAFFIN WAX. *Chem. Eng. Sci.* (British) 2, 69-73 (1953) April.

Experiments on the batch destructive hydrogenation berginization of paraffin wax at 450°C are described, in which the influence of different catalysts was investigated, especially with respect to the properties of the liquid reaction products. The catalysts used were well-known hydrogenation catalysts such as Ni on guhr, MoS_2, MoO_3 and WS_2 and also a synthetic cracking catalyst (Al_2O_3-SiO_2) prepared by hydrolysis of a mixture of aluminium isobutylate and

silicon tetraethylate. Also a mixed type catalyst was used prepared by coprecipitation of MoS_2, Al_2O_3 and SiO_2. Pure white Rangoon paraffin wax of mol weight of 360 was again chosen as the base material. Authors' Abstract

Gardner, G. D. and Donovan, J. T. CORROSION AND EROSION IN THE SYNTHETIC-FUELS DEMONSTRATION PLANT. *ASME Trans.*, 75, 525-533 (1953) May .

After two years of intermittent operation, the coal hydrogenation plant of the Bureau of Mines had developed a number of isolated cases of corrosion and erosion which were quite severe. These failures have been thoroughly analyzed and corrective measures taken which have for the most part overcome the initial difficulties. Complete descriptions of instances of stress corrosion, intergranular corrosion, hydrogen embrittlement, caustic, embrittlement, and abrasive solids action are given together with the preventive action taken. One interesting and not completely eliminated problem involves the rapid erosion of valve seats used in throttling abrasive-containing oil from 10,000 psi to atmospheric at flow rates of 500 to 800 gph. Seats made of tungsten-titanium carbide and cast boron carbide gave only limited satisfactory service. J. M. Reid

Shibata, K. LIQUID-PHASE COAL HYDROGENATION: THE JAPANESE WERE USING IT IN 1942. *Chem. Eng.*, 6, 214-218 (1953) May.

A flow-sheet and description of a liquid-phase coal hydrogenation plant operated by Japan during the last war. The essential feature of the plant was the hydrogenation reaction vessel with provision for internal heat-exchange of reactants and products. Space velocities were about 3 times higher than for comparable German reactors. W. G. Bair

Production Problems

Williams, O. B. LITTLE BUGS . . . BIG PROBLEMS. *World Oil*, 136, 170, 172, 175 (1953) June.

Sulfate reducing bacteria occur almost universally in oil field brines. In the injection of salt water for flooding, the bacteria tend to reduce the effective formation porosity by depositing insoluble sulfides. Laboratory experiments indicate that the bacteria can be controlled by the addition of surface active agents to the brine, the particular agent for each case being chosen with regard to the individual conditions. B. E. Eakin

7. ANALYTICAL METHODS AND TESTS

Combustion Gases

Gooderham, W. J. AN APPARATUS FOR MEASURING THE PRODUCTS FROM, AND THE OXYGEN REQUIRED IN, THE COMBUSTION OF GASES. *World Oil*, 20, 477, 478 (1953) May 16.

An apparatus for determining the oxygen required for and the contraction in volume, sulfur oxides, carbon dioxide, and water from combustion of fuel gas is described. A continuously flowing system is used in which rates of flow of gas, air and oxygen for combustion, combustion products, combustion products after absorption of carbon dioxide, and again after absorption of oxygen, are all measured by means of soap film meters. Sulfur oxides are absorbed in hydrogen peroxide and determined acidimetrically. D. M. Mason

CO Determination

Goffredo, L. RASSEGNA DEI METODI PER LA DETERMINAZIONE DI PICCOLE QUANTITA DI OSSIDO DI CARBONIO (REVIEW OF METHODS FOR THE DETERMINATION OF SMALL QUANTITIES OF CO). *Rivista Combustibili* (Italian), 7, 84-95 (1953) February.

The author points out the danger of CO as a blood poison, which because of its high combining affinity with the hemoglobin, impedes the purification of the blood in the lungs and the circulation of oxygen in the body. Hence, the extreme importance of the detection and determination of CO in garages, plants, hangars and laboratories. Detailed descriptions of the various chemical methods (I_2O_5, $PdCl_2$, HgO, CuO), colorimetric methods as Draeger's, National Bureau of Standards', catalytic combustion

methods, infrared and physiological analysis (the gas is examined in a solution of hemoglobin) are given. In view of the increasing production facilities, these methods will come in to actual demand and should not be neglected during construction. The I_2O_5 procedure is considered the best for practicability and range of accuracy. S. Sensi

Flue Gas Sulfur

Corbett, P. F., Flint, D. THE INFLUENCE OF CERTAIN SMOKES AND DUSTS ON THE SO_3 CONTENT OF THE FLUE GASES IN POWER-STATION BOILERS. *J. Inst. Fuel* (British) 25, 410-417 (1953) May.

The object of the tests described was to minimize fouling and corrosion of the external heat-exchange surfaces by sulphur trioxide in the flue gases. In the earlier tests the dew-point meter alone was used to assess potential trouble; later, both a chemical method of analysis and a corrosion probe were used. The preliminary tests with zinc oxide smoke confirmed that a sufficiency of fine particle material could remove, or inhibit the formation of, sulphur trioxide in the flue gases. On occasions additions of as little as 0.25 per cent Zn by weight of the fuel burnt were sufficient to remove a sulphuric acid dew-point of 310°F. In the next series of experiments dust collected from the electrostatic precipitators of adjacent pulverized fuel-fired boilers was used, and, finally, tests were carried out on two boilers (one a chain-grate-fired boiler and the other retort-fired) both of which had been fitted with auxiliary pulverized-fuel burners. It was confirmed, by all three methods of assessment, that, quite apart from its other advantages, auxiliary pulverized-fuel firing had materially diminished the corrosive nature of the flue gases. The paper concludes with suggestions as to the mechanism of the action of dusts on flue gases.
Author's Abstract

Gas Spectrometry

Slobod, R. L. AN INTERFERING FACTOR IN GEOCHEMISTRY. *Petroleum Eng.*, 25, B129, B134 (1953) May.

By use of the mass spectrometer the presence of nitrous oxide in soil air and soil gas samples has been confirmed. In all of the soil air samples analyzed (58) nitrous oxide was found to comprise 50 per cent or more of the "condensable" gas fraction. Although hydrocarbons can be differentiated from the nitrous oxide if combustion methods are used and are carefully interpreted, it appears to be practically impossible to separate nitrous oxide from ethane by the usual physical methods used because of the closeness of their boiling points (both boil at approximately -89 C). It is suggested, therefore, that nitrous oxide may have comprised a substantial part of the "ethane" reported in geochemical studies where combustion methods were not used to effect a separation of these gases. Author's Abstract

Petroleum Sulfur

Birch, S. F. SULPHUR COMPOUNDS IN PETROLEUM. *J. Inst. Petroleum* (British) 39, 185-205 (1953) April.

Work on the isolation and identification of sulfur compounds from petroleum naphthas is summarized. Recent results of investigation of sulfur compounds in the acid sludge obtained in treating an Agha Jari kerosene SO_2 extract are reported. Presence of tri- and tetra-substituted thiophenes was established, though the bulk of the sulfur compounds consisted of mono and bicyclic sulfides. The relationship of these compounds and others to the sulfur compounds present in crude oil is discussed. D. M. Mason

8. GENERAL AND PHYSICAL CHEMISTRY

Catalysis

Boudart, M. HETEROGENEOUS CATALYSTS. *Ind. Eng. Chem.*, 45, 898-902 (1953) May.

Papers presented in the field of heterogeneous catalysis kinetics since 1951 are briefly outlined. Considerable emphasis on the nature of the catalytic surface as to its geometric and electronic characteristics, the mechanism of the adsorption process, and the active centers characteristics is made. S. Mori

Liquid Diffusion

Koeller, R. C. and Drickamer, H. G. THE EFFECT OF PRESSURE ON DIFFUSION IN CS_2 ORGANIC MIXTURES. *J. Chem. Physics*, **21**, 575-588 (1953) April.

Diffusion coefficients are presented at pressures up to 10,000 atmospheres and 20-40°C. for 50 mole percent CS_2 in n-heptane, 2-4 dimethylpentane, toluene, methylcyclohexane, n-octane, chlorobenzene, n-butanol and isobutanol. One mixture of 20 mole % CS_2 in chlorobenzene was also investigated. The effect of pressure on the structure of liquids is discussed and the results are interpreted in terms of activation volume, enthalpy and entropy.

R. E. Peck

Propane Thermodynamics

Selleck, F. T., Opfell, J. B. and Sage, B. H. APPLICATION OF BENEDICT EQUATION OF STATE TO PROPANE. *Ind. Eng. Chem.*, **45**, 1350-1354 (1953) June.

Several sets of coefficients of the Benedict equation of status are presented for predicting thermodynamic properties of propane in the homogeneous region. These coefficients are calculated by assuming several values of the exponent "gamma" and using the least-squares procedure. Values calculated by these equations are compared with the experimental data of the several authors. D. C. Gami

Solid Reactions

Booth, F. THE THEORY OF SELF-PROPAGATING EXOTHERMIC REACTIONS IN SOLID SYSTEMS. *Faraday Soc. Trans.*, **49**, 272-281 (1953) March.

A mathematical equation for determining the rate of progression of a self-propagating exothermic solid phase reaction through a mixture of reactants is developed, and the equation is tested against the experimental results of the BaO-Fe system. The correlation between the calculated and the experimental is fair. S. Mori

Specific Heat

Schrock, V. E. CALORIMETRIC DETERMINATION OF CONSTANT-PRESSURE SPECIFIC HEATS OF CARBON DIOXIDE AT ELEVATED PRESSURES AND TEMPERATURES. Nat. Adv. Comm. Aeronautics, Tech. Note 2838 (1952) December.

The constant pressure specific heat of carbon dioxide has been measured over the range of pressures and temperatures from ambient condition to 1000 psig and 1000°F using a steady-flow calorimeter operating on an open cycle.

D. C. Gami

Surface Area

Blocker, H. G., Craig, S. L. and Orr, C., Jr. DYNAMIC GAS ADSORPTION METHODS OF SURFACE AREA DETERMINATION. *J. Phys. Chem.*, **57**, 517-520 (1953) May.

Two dynamic methods of obtaining surface area measurements on solid surfaces are presented in this article. Fair agreement was obtained in the comparison of these methods to the time-consuming equilibrium state methods of the B.E.T. S. Mori

Water Properties

Lagemann, R., Gilley, L. W. and McLeroy, E. G. THE ULTRASONIC VELOCITY, DENSITY, AND COMPRESSIBILITY OF SUPERCOOLED H_2O and D_2O. *J. Chem. Physics*, **21**, 819-821 (1953) May.

The velocity of compressional waves in liquid water (H_2O and D_2O) has been measured over a range of temperature extending to some six degrees below the nominal freezing point, using a fixed-frequency variable-path sonic interferometer. The density of heavy water in the supercooled state has been determined and values of the adiabatic compressibility calculated. The curves representing the variation of density with temperature are symmetrical and congruent for the two isotopic liquids. It is confirmed that the compressibility of D_2O is greater than that for ordinary water. The new measurements of the three properties yield values which fall on smooth extrapolations of the previously known data, indicating that there is no partial ordering of the liquid structure into the solid structure at temperatures below the nominal freezing point, at least none at times removed from the start of observed freezing.

Authors' Abstract

9. ORGANIC CHEMISTRY

Aromatics

Hazlett, F. P. (assigned to Jones and Laughlin Steel Corp.) PURIFICATION OF AROMATIC HYDROCARBONS. U. S. 2,639,304 (1953) May 19.

Reduction of amounts of "paraffin" hydrocarbons from aromatics recovered from coal carbonization is claimed by treating the aromatics with 1 to 3 wt. % of anhydrons aluminum chloride and 0.1 to 0.6 wt. % of alpha picoline at temperatures and pressures below the boiling point of the aromatics. After one to 3 hrs. contact (depending on agitation) the mixture is water washed, acid washed and distilled. The picoline promotes effective action at lower temperature and with less tar formation.

O. P. Brysch

Extractive Crystallization

SEPARATION OF ISOMERIC HYDROCARBONS. *Petroleum*, **16**, 151, 152, 155 (1953) June.

A new process for the separation of hydrocarbons by type is based on the ability of urea to form crystalline complexes with straight-chain paraffins only and a similar tendency exhibited by thiourea to form well-defined solid adducts with isoparaffins. The combination of these two striking and highly selective co-ordination reactions permits sharp separation between isomeric hydrocarbons. The process which represents a wholly new unit operation, has been dubbed "extractive crystallization."

D. J. Dennison

Phenol Synthesis

Nieuwenhuis, H. K. PHENOL, ACETONE, ISOPROPANOL: CUMENE PROCESS RECASTS TRIO'S FUTURE. *Chem. Week*, **72**, 30, 31 (1953) May 2.

Cumene-phenol plants under construction are expected to have about 14% of the country's synthetic phenol capacity. As a co-product about 50 million lbs./yr. of acetone will be produced. Additional cumene-phenol plants are likely to have a heavy impact upon acetone and isopropanol production. The economics of the process are discussed and predictions of future phenol demand are given.

G. V. Vosseller

Schoch Process

Schoch, E. P. (assigned to The Board of Regents of The University of Texas) METHOD AND APPARATUS FOR GLOW DISCHARGE TREATMENT OF GASES. U. S. 2,638,443 (1953) May 12.

This patent covers the Schoch process for the production of acetylene and similar materials. Reforming of light hydrocarbons (natural gas) is accomplished with an electric glow discharge developed by high voltage A.C. current at pressures between 0.75 and 3.0 atmospheres. The electrode is formed in the shape of an impeller which rotates during operation to move the reactants and products through the electric discharge at high velocity, thus keeping the actual hydrocarbon temperature relatively low. Energy efficiencies of 30 to 50% are claimed with acetylene production above 2.6 cu ft/kwh.

J. M. Reid

10. CHEMICAL ENGINEERING

Computer Techniques

Robb, E. J. and Heydt, H. L. SOME ELECTRONIC ANALOGUE COMPUTER TECHNIQUES. Univ. Connecticut Eng. Exp. Station (1953) January.

Various methods are described for performing the operations of addition, subtraction, multiplication, division, and exponentation, using electronic circuits. A method for generating non-linear functions utilizing biased-diodes, is also described. Overall accuracy has been about 4% of full scale value. It is expected that accuracy improvement can be effected by careful circuit design.

B. E. Eakin

Diffusion

Garbo, P. W. GASEOUS DIFFUSION PROCESS. U. S. 2,637,625 (1953) May 5.

A gaseous diffusion process that employs moving solids on either or both sides of the diffu-

sion membrane. The process is also applicable to catalytic reactions and continuous separation of the reaction products.

G. V. Vosseller

Fluid Flow

Baron, T. and Oppenheim, A. K. FLUID DYNAMICS. *Ind. Eng. Chem.*, 45, 941-951 (1953) May.

A review of the latest work, this article is of interest to those concerned with the theoretical development of flluid flow. R. F. Bukacek

Gas Stream Gradients

Schlinger, W. G., Berry, V. J., Mason, J. L. and Sage, B. H. TEMPERATURE GRADIENTS IN TURBULENT GAS STREAMS. NON-UNIFORM FLOW. *Ind. Eng. Chem.*, 45, 662-666 (1953) March.

Point temperatures were measured in a turbulent gas stream. Eddy viscosity is included with the usual viscous shear. Results are presented as relative viscosity against position and Reynolds number. Temperatures are plotted against position at right angles to the wall with down-stream distance as a parameter. Point velocities are recorded in a similar manner. R. E. Peck

Schlinger, W. G., Hsu, N. T., Cavers, S. D. and Sage, B. H. TEMPERATURE GRADIENTS IN TURBULENT GAS STREAMS: MEASUREMENT OF TEMPERATURE, ENERGY, AND PRESSURE GRADIENTS. *Ind. Eng. Chem.*, 45, 864-870 (1953) April.

Temperature, energy and pressure gradients were measured in a turbulent air stream. The results are presented as graphs of position in the channel against point temperatures. Heat transfer results are presented as a Nusselt number against the Reynolds number, and results for shear and pressure drop are presented as a friction factor against a Reynolds number.

R. E. Peck

Heat Transfer Medium

Da Fano, E. (assigned to John B. Pierce Foundation) HYDROLYSIS RESISTANT HEAT TRANSFER COMPOSITION. U. S. 2,640,031 (1953) May 26.

Heat transfer mediums made from orthosilicates in various mixtures to provide mediums resistant to hydrolysis by water. Range of temperatures covered is from -62°F to 372°F.

G. V. Vosseller

Heat Transfer

Eckert, E. R. HEAT TRANSFER. *Ind. Eng. Chem.*, 45, 951-956 (1953) May.

The author presented a review of the literature on heat transfer published in the last year. Fields of research which received special attention were. heat conduction, forced-convection, heat transfer, flow with separation regions, natural convection, film and transpiration cooling, change of phase, radiation, temperature measurement, instrumentation and applications of heat transfer. R. E. Peck

Grimble, R. E. and Fawcett, S. L. HEAT TRANSFER MEASUREMENTS BY THE METHOD OF CYCLIC TEMPERATURE VARIATIONS. Am. Soc. Mech. Eng. Paper No. 52-A-68 New York, November 30, 1952.

Convective heat transfer coefficients were measured by measuring the change in phase and amplitude of temperature in a fluid stream hava controlled cyclically varying temperature. Equations have been developed which relate the heat transfer coefficient to the temperature amplitude and other measureable properties of the system. Surface temperatures need not be measured when using this method. R. E. Peck

Mass Transfer

Pigford, R. L. MASS TRANSFER. *Ind. Eng. Chem.*, 45, 957-962 (1953) May.

A critical review of the past year's literature on mass transfer is presented. Transfer of material to drops, including information on the mechanism of transfer inside the drops have been reported. Several articles have been presented on intraparticle diffusion and mechanisms of transfer have been postulated. Some of the subjects covered are thermal diffusion, turbulent diffusion, heterogeneous diffusion and mass transfer across interfaces.

R. E. Peck

Schlinger, W. G. and Sage, B. H. MATERIAL TRANSFER IN TURBULENT GAS STREAMS. CONCENTRIC FLOW. *Ind. Eng. Chem.*, 45, 657-661 (1953) March.

Natural gas was injected by an axial tube into an air stream and the gas sampled at various positions down stream. The results of these experiments were used to calculate the eddy diffusivity throughout the gas stream. Experiments were performed at various velocities and the overall diffusivity was plotted against the gross velocity. Point velocity traverses were determined at four positions along the tube. R. E. Peck

Piping Design

Wilbur, W. E. THERMAL STRESSES IN PIPING SYSTEMS. PART III. *Petroleum Refiner*, 32, 174-178 (1953) May.

A simplified approach to calculations of pipe stresses where the system extends to three dimensions. This is the concluding article of the three part series. W. G. Bair

Tar Distillation

Wilton, T. O. (assigned to Chemical Engineering, Wiltons Ltd.) DISTILLATION OF TARS AND LIKE LIQUID HYDROCARBONS. U. S. 2,640,013 (1953) May 26.

A distillation process is claimed that tends to eliminate water vapor frothing in the distillation column. W. J. Pleticka

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Engineering Computation

Rose, A., Schilk, J. A. and Johnson, R. C. COMPUTERS, STATISTICS AND MATHEMATICS. *Ind. Eng. Chem.*, 45, 933-940 (1953) May.

This review gathers together the recent references and indicates the status of the general technology of computers, statistics and mathematics as related to chemistry and chemical engineering. Most attention is given to the publications of the last 2 or 3 years. Recent papers on application of mathematical techniques in the solution of unit operation problems are emphasized. B. E. Eakin

Flow Meters

Ergun, S. PRECISION MEASUREMENTS OF GAS FLOW RATES. *Anal. Chem.*, 25, 790-792 (1953) May.

A method for the calibration of laboratory capillary and orifice type flowmeters is presented. Pressure loss in isothermal flow is expressed as the sum of viscous and kinetic energy losses and a method for obtaining constants characteristic of the meter is described. R. F. Bukacek

Gas Cooling

Pollard, R. THE COOLING OF GASES AND VAPORS. *Gas J.* (British) 274, 428-430, 438 (1953) May 20.

A standard water cooled, cross-flow tube condenser was used in cooling manufactured gases. The experimental results checked with the method outlined by Colburn & Hougen in 1934, and its use for design calculations seems perfectly valid. W. G. Bair

Heat Exchanger Costs

Rubin, F. L. HEAT EXCHANGER COSTS TODAY. *Chem. Eng.*, 60, 201-206 (1953) May.

Up-to-date cost data have been compiled from manufacturers quotations for heat exchanger types and sizes in common usage. These data have been converted to a heat transfer-area basis and are presented in graphical form. J. M. Reid

Mass-Flow Meter

Li, Y. T. and Lapp, P. A. THIS NEW FLOWMETER MEASURES TRUE MASS-RATE. *World Oil*, 136, 215-218 (1953) June.

A new flow meter is described which measures mass rate linearly, thus eliminating the influence of pressure, viscosity, density and temperature. The principle of operation is based on measurement of the moment required to apply a Cariolis acceleration to the fluid stream. Bi-directional measurement is possible on in-

homogeneous and multiphase fluids with response rates of several hundred cycles per second making indication of pulsating flows very accurate. J. M. Reid

Reactor Erosion

Bland, R. E. (assigned to Houdry Process Corp.) ART OF PROTECTING THE WALLS OF VESSELS CONTAINING FLUENT GRANULAR SOLIDS. U. S. 2,639,215 (1953) May 19.

An invention claiming to prevent erosion on the walls of catalyst regeneration furnaces wherein a downwardly moving non-turbulent solid catalyst is used. Erosion is prevented by building shelves on the walls in such fashion as to permit a static mass of catalyst to protect the walls. G. V. Vosseller

12. MATERIALS OF CONSTRUCTION

Corrosion

Farrar, G. L. MITIGATING CORROSION IN PROCESSING EQUIPMENT. *Oil Gas J.*, 51, 101-106 (1953) May 4.

A resumé of different corrosion problems and their solutions as practiced by some industries is presented by the author. Cathodic protection of heat transfer equipment results in a savings of more than five times the investment cost. Other problems covered are corrosion due to naphthenic acid, gas streams, hydrogen sulfide, steam condensate, etc. A. R. Khan

Parker, M. E. CATHODIC PROTECTION PARASITES. *Petroleum Eng.* 25, D22-D26 (1953) May.

Types of "cathodic protection parasites" to pipe lines (metal that will steal protection from lines), and methods of prevention and elimination of these are discussed. A. J. Tulis

Hot Water Storage Tanks

Weast, R. C. A STUDY OF SOME VARIABLES WHICH INFLUENCE THE CORROSION RATE OF GALVANIZED STEEL HOT WATER STORAGE TANKS. Paper presented at Am. Gas Assoc. Research & Utilizn. Conf. Cleveland, (1953) April 8-9.

Excluding water composition, the variables influencing the corrosion rate of galvanized steel hot-water storage tanks are studied. Effects of varying the water temperature, heating rate, and water withdrawal rate are indicated by the determination of oxygen, iron, and zinc in the water and by photographs of the corroded steel. A. J. Tulis

Hydrogen Attack

Skei, T., Wachter, A., Bonner, W. A. and Burnham, H. D. HYDROGEN BLISTERING OF STEEL IN HYDROGEN SULFIDE SOLUTIONS. *Corrosion*, 9, 163-172 (1953) May.

Extensive damage to some refinery equipment has occurred owing to transmission through steel of the hydrogen formed during corrosion of steel by hydrogen sulfide solutions. Damage in the form of hydrogen blistering, fissuring and embrittlement of steel has been particularly severe in catalytic cracking gas plants. Laboratory investigations have been made of the relative influence of environmental factors on the rate and extent of hydrogen transmission through carbon steel. These studies include determination of the effects of concentration of important constituents such as hydrogen sulfide, low molecular weight organic acids, ammonia and hydrogen cyanide. Several other compounds were studied and found to be of minor importance. Mechanisms involved in effects of these substances are postulated. Use of alloy steels for prevention of blistering was briefly investigated, but environmental methods of prevention were found to be more economical. D. M. Mason

Plastics

Seymour, R. B. PLASTIC MATERIALS OF CONSTRUCTION. *Corrosion*, 9, 152-159 (1953) May.

Plastics are mainly used in the process industries as protective coatings, linings, joining materials, and chemical resistant cements. In order to insure proper application, further information on corrosion resistance and physical properties is required. This will permit the

construction of chemical equipment now considered impossible and will lead to use in reaction vessels, heads, towers. A. R. Khan

Whitney, F. L., Jr. THE CORROSION ENGINEER USES PLASTICS. *Corrosion*, 9, 123-131 (1953) April.

Continued progress in the development and improvements in the properties of plastics places these materials high on the materials of construction lists for the corrosion engineer to consider. To achieve maximum performance and economy in their use — what they are, what their chemical and physical limitations are and how they are best applied and installed must be known. An attempt is made to simplify the task of acquiring general knowledge of the plastics by dividing into three major groups and thirteen "families". Factors to be considered in order to obtain good performance are presented. These include effect of composition, when to use thick and thin films, importance of surface preparation, testing procedures and design and economics. The effects of polymerization, the use of modifiers, plasticizers, pigments and binders are briefly discussed in relation to corrosion resistance and physical properties. Some "do's and don'ts" on the use of thin and thick films are outlined and illustrated. If more adequate testing procedures are employed, considerable time and money can be saved; a brief outline of some of the more important features are mentioned. Design is important to good performance, whether the plastic is used as a coating, a lining, or a solid installation. Author's Abstract

Selection of Metals

Hoover, M. M. METALS FOR EXTREME TEMPERATURES. *Chem. Eng.*, 60, 212-215 (1953) June.

Equipment failure under extreme temperature conditions (— 20 and + 1550°F) may be avoided by the proper selection of metals and alloys capable of withstanding the extreme operating conditions. Other factors such as corrosion, reactive feed stock should also be considered. A few illustrations presenting poor and highly resistant alloys are given. S. Mori

Stainless Steel Welding

Thielsch, H. WELDING THE STAINLESS STEELS. *Materials and Methods*, 37, 115-130 (1953) May.

A complete treatment of materials and methods for welding the commercial stainless steels is described. W. G. Bair

13. NEW BOOKS

Refinery Process Design

Edmister, W. C. HYDROCARBON ABSORPTION AND FRACTIONATION PROCESS DESIGN METHODS. Collective reprint by *The Petroleum Engineer*, Dallas, Texas (1953) May: 131 p. $1.50.

The fractionation equipment of a modern refinery represents 30 to 45 per cent of the total equipment cost. Yet in the engineer's eagerness to push ahead into catalytic conversion and reforming, he is tending to neglect some of the most fundamental processes, such as absorption and fractionation, that are employed in all hydrocarbon refining. In this treatment of the process engineering of hydrocarbon absorption and fractionation, the main objectives are: (a) to summarize the basic concepts and fundamentals; (b) to review recent important contributions; (c) to present new design methods, and (d) to outline design and calculation procedures. The presentation is conveniently divided into two main topics: absorption and stripping, and fractionation. The first eight chapters concern the definitions and conceptions of vapor-liquid phase equilibrium and the equations, charts, and calculation methods used in designing for absorption-stripping operations. Chapters 10 through 19 discuss the fundametals of fractional distillation, binary and multi-component calculations, bubble-plate column design methods, and plate efficiencies. The presentation contains many calculations and graphical illustrative problem solutions, and 168 figures and tables. This booklet should prove of considerable value to those engaged in the petroleum refining industry, particularly in the field of design and operation of fractioning equipment. B. E. Eakin

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